REMARKS

The undersigned would like to thank the Examiner for the courtesy in making himself available for a further interview regarding the subject application on October 18, 2006. Again, the undersigned extends his apologies for canceling at the last minute.

With entry of this amendment, former claims 16-26, 28-32, and 37-42 remain pending, and new claim 43 has been added. Independent claims 16, 29 and 37 have been respectively amended to more particularly point out and recite that the claimed lighting system provides an unfiltered, LED-based illumination source for a slide or other biological specimen viewing or imaging apparatus inventions. New independent claim 43 is based on page 16, lines 13-15 of the original specification. No new matter has been added.

Applicant acknowledges and appreciates that claims 26, 41 and 42 were deemed in the current Office Action to be allowable if rewritten in independent form including all limitations of the base claim and any intervening claims. Withdrawal of the claim rejections and allowance all pending claims is respectfully requested in view of the foregoing amendments and the following remarks.

Douglas-Hamilton et al. USP 6,445,451

Claims 16-18, 21 and 22-24 stand rejected under 35 U.S.C. 102(e) as being allegedly anticipated by USP 6,445,451 ("Douglas-Hamilton").

Douglas-Hamilton discloses and describes a reader for stained samples using one or more high power LEDs. However, the LEDs in the Douglas-Hamilton reader device are discrete (e.g., epoxy encapsulated) LEDs, which are not assembled as an array of closely spaced LEDs including a first LED positioned side-by-side with a second LED, as required by claim 16. Instead, as

shown in Fig. 4 thereof, the LEDs in Douglas-Hamiton are "two light sources 64a and 64b" that are "disposed along axial tube 67," in which "[m]ore light sources may be added up stream LED 64b, with appropriate dichroic mirrors added up stream mirror 63." (Column 5, lines 20-23). In particular, the Douglas-Hamilton device employs sequential mixing of light from independent LEDs using dichroics, rather than an array of co-located LEDs in which the light output mixes without interference of a grating or other bandwidth filter, as recited in claim 16. No mention is ever made in Hamilton-Douglas of the LED dies, or the need (or alternative) to position the LEDs in a side-by-side arrangement.

In contradistinction, the illumination system of claim 16 employs an array of closely positioned LEDs that may be used, for example, in a standard microscope light collector assembly, e.g., in place of the lamp filament of a Koehler illuminator (as recited in dependent claim 38). The separate LEDs of Douglas-Hamilton will not work for this purpose, and require an arrangement of dichroic mirrors for mixing of the light output from the individual LED sources. This arrangement is fundamentally different from the illumination system recited in claim 16 (as amended), which specifically excludes dichroic mixing of the light propagated from the respective first and second LEDs of the array.

For at least this reason, independent claim 16, along with claims 17-18, 21 and 22-24 depending therefrom, are believed patentable over Douglas-Hamilton.

<u>Miller et al. USP 6,373,568</u>

Claims 16-25, 28, 29-32 and 37 stand rejected under 35 U.S.C. 103(a) as being allegedly unpatentable over USP 6,373,568 (“Miller”).

Miller discloses and describes the use of LEDs as a light source for determining the absorbance spectrum of an object in a microscope or similar optical system. The goal is to have a

controlled light source that allows a sample to be illuminated with light at many different narrow band wavelengths. They accomplish this by using multiple colors of LED light sources, collecting the light from each LED, and *projecting it onto a narrow bandpass filter*, and then use the resulting narrow band (much less than single LED spectrum) of light in a microscope or spectrometer or photometer.

Importantly, Miller teaches against using unfiltered LEDs as a light source. For example, at column 2, (beginning on line 1), Miller states, "[t]he use of red, green and blue LEDs for illumination is known in the art, both in time-sequential fashion or simultaneously. The colors produced by such systems are broad, ill-defined, and would not be suitable for applications that involve precise quantitative spectral measures or indicia." By way of further example, at column 4, beginning at line 43, Miller states, "[l]enses collimate the light from each LED and bandpass filters provide spectral filtration of the various bands so that the light in each band has a very well-defined spectral range with much greater specificity than that defined by the LEDs themselves."

Further, the drawings and description of Miller focus on the use of discrete (epoxy encapsulated) LEDs, which are inherently a few millimeters (typically 5) in diameter. The light from these LEDs *must then pass through a filter* in order to obtain the narrow band wavelength required for this invention. In another embodiment of Miller, a grating is used to narrow the band of the light so that it can be used (See col. 4, lines 53-61). With respect to this embodiment, Miller mentions individual die, but *only in combination* with a grating, as described in USP 5,029,245 (Keranen - see below). Regarding the “closely spaced” limitation of claim 16, and the use of the LED array to replace the lamp filament of a Koehler illuminator in claim 38, such an arrangement is clearly not contemplated or suggested by Miller, which instead requires the use of "scrambling optics," implying that the light from the individual LEDs is fairly discrete and needs sufficient

work to be thoroughly mixed. (See column 7, lines 15-51, "…it is essential to scramble the resultant beam so that its output spatial pattern is free of spectral variations to the greatest extent possible.") Similarly, Miller describes the use of a lens "telescope" to collect the light from the discrete LED/Filter sources and get it into the fiber or scramble.

USP 5,029,245 (Keranen), referenced in Miller (col. 6, line 66, to col. 7, line 6), describes a multi-colored LED light source consisting of either LED die or discrete (encapsulated) LEDs connected to a light fiber. This LED light source is then projected onto a grating to spread the wavelength of the LED so that a higher resolution (smaller bandwidth of radiation) can be created than is possible when using the LED by itself. This VERY narrow band wavelength is then reflected from an object or passed through an object to measure its reflection or absorbance at that particular narrow band wavelength. Keranen is basically describing the use of a solid state light to substitute for the typical broad spectrum white light source. The emphasis is on the solid state…a means of optically separating the color into very narrow bands as used in a spectrometer or photometer is still required. In particular, Keranen teaches that a single LED by itself cannot be used as a light source, since its emission spectrum is too broad for use in a spectrometer or photometer. Again, a subdivision of the LED spectrum is required in order to be useful as a light source for a spectrometer or photometer. In Keranen (both its specification and its claims), an "optical means" for further subdividing the spectrum for the LED is always required. Keranen specifically describes the use of a grating to allow more narrow bands of light to be extracted by bounding the light off or through a grating, and then using a mechanical "slit" to select the narrow bit of color they need.

In sum, the apparatus disclosed and described in Miller and Keranen require bands of light that are far more narrow than is provided by standard LED die, and which therefore requires the

use of a grating or other bandwidth filter, which is specifically excluded from the scope of the amended independent claims 16, 29 and 37 of the present application.

Nakasato USP 5,262,891

Claim 38 stands rejected under 35 U.S.C. 103(a) as being allegedly unpatentable over Miller in view of USP 5,262,891 ("Nakasato"). As amended, claim 38, which depends from claim 16, recites that the optical instrument comprises a microscope, with the LED array positioned in a general position of a lamp filament of a Koehler illuminator of such instrument. Briefly put, Nakasato does not supply the missing teaching of Miller (or of Douglas-Hamilton), i.e., of an illumination source comprising a closely spaced array of at least two LEDs that provide illumination of a slide in place of a standard lamp filament in a Koehler illuminator, without dichroic mixing of the light emitted by the at least two LEDs, and without passing the light through a grating or other bandwidth filter.

Wunderman at al. USP 6,122,042

Claims 39 and 40 stand rejected under 35 U.S.C. 103(a) as being allegedly unpatentable over Miller in view of USP 6,122,042 ("Wunderman"). The Wunderman reference has been discussed at length in early papers during prosecution of this application, and need not be re-visited in this response, except to point out that the missing teaching of a closely spaced array of at least two LEDs that provide an illumination source without dichroic mixing and without passing the light through a grating or other bandwidth filter is also absent from Wunderman.

New Claim 43

Regarding new claim 43, the Applicant respectfully points out that none of the prior art references of record disclose or suggest a light source for a microscope comprising an LED module comprising an array of LEDs, including a first LED emitter having a first narrow band

wavelength and a second LED emitter having a second narrow band wavelength different from the first narrow band wavelength, the first and second LEDs being separately controllable and *arranged side-by-side, such the two LEDs fall within a 4 mm diameter*.

CONCLUSION

In view of the forgoing claim amendments and remarks, the existing rejections are believed to be overcome, and a Notice of Allowance is respectfully requested. The Examiner is invited to call the undersigned with any questions regarding this paper or the application generally.

Respectfully submitted,
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